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regions are connectable to form briefs
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A diaper including an absorbent body comprising a liquid permeant
inner sheet, a liquid impermeable outer sheet and an absorbent
member disposed therebetween, and a water impermeant
outermost layer to which the absorbent body is fastened and which
in use, holds the absorbent body against the body of the user, t
outermost layer having front and rear portions whose edges are
connected together so that it is in the form of a pair of briefs with
waist opening and two leg openings, the outermost layer carrying
least one expandable elastic member around that opening, t
outermost layer also carrying at least one expandable elastic
member which extends across the front and rear portions at
position between the waist and leg openings and serves, in use,
tighten the outermost layer against the body of the wearer.

Fig .1

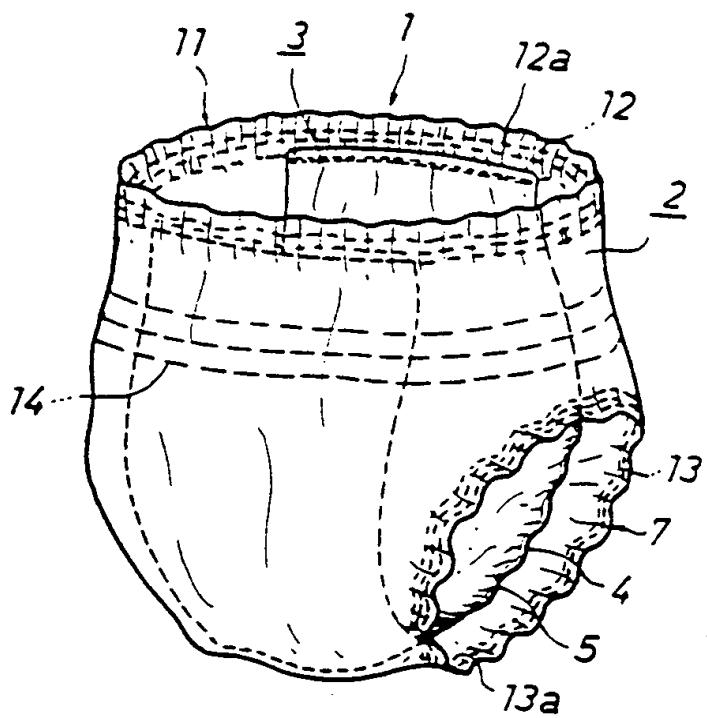


Fig. 2

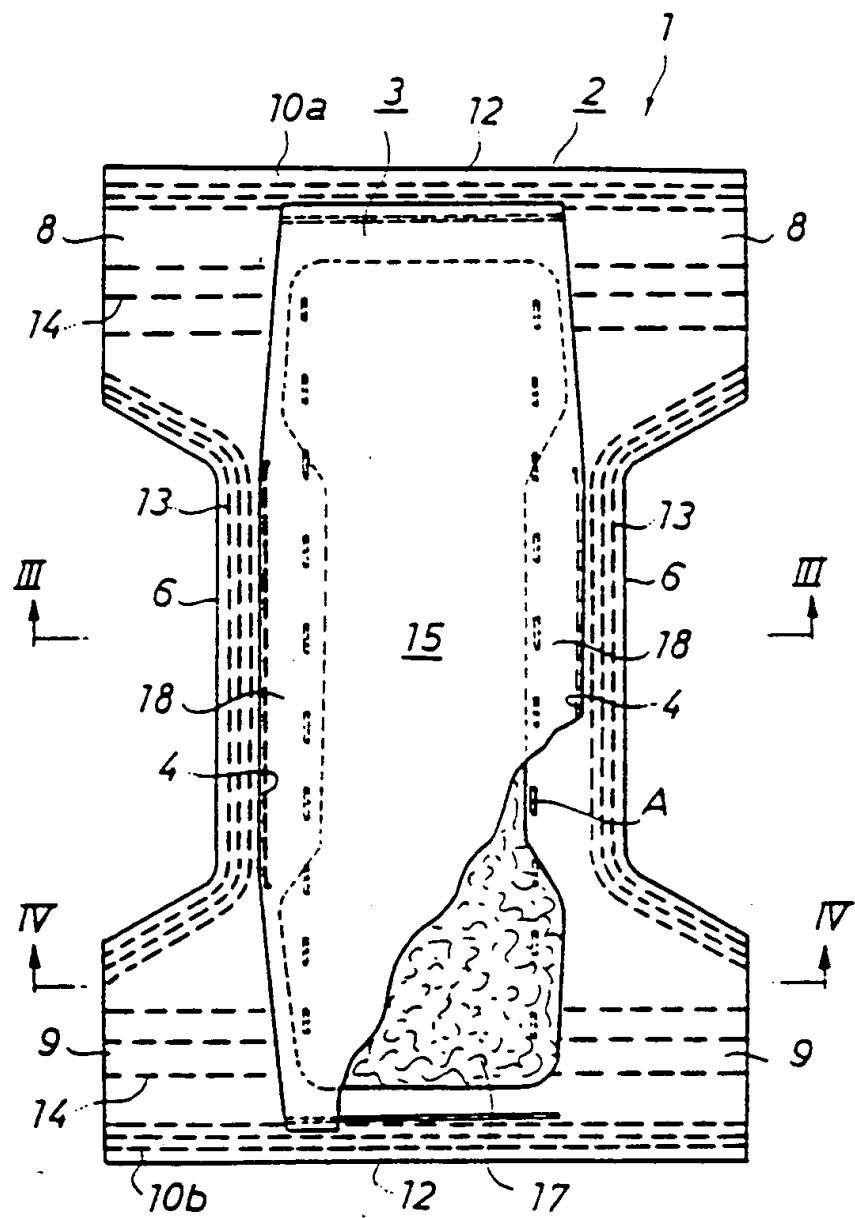


Fig .3

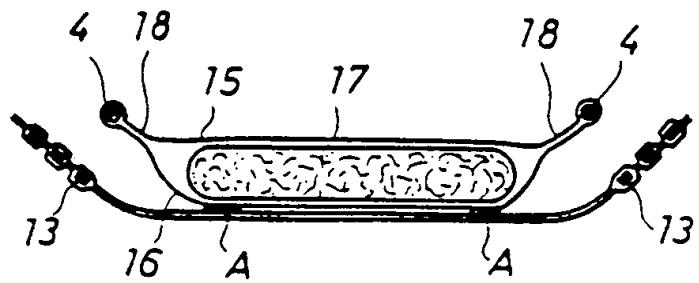
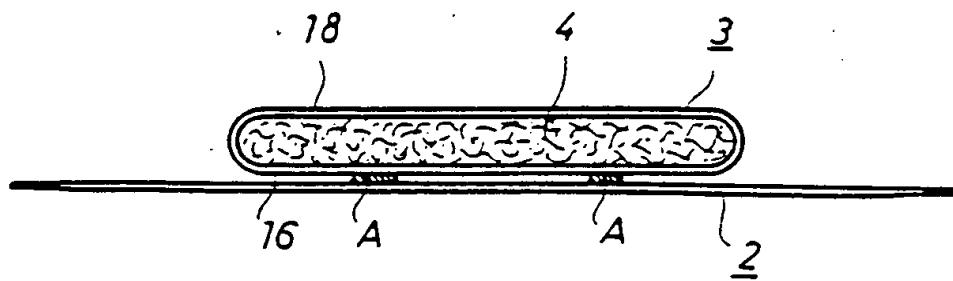


Fig .4



DIAPERS

The invention relates to diapers for use by babies, children or incontinent adults and is concerned with that type of diaper which is of briefs type, that is to say is in the form of a pair of pants or shorts.

The most widely used type of disposable diaper is of so-called flat type, as disclosed for example in Japanese Patent Publication No. Sho 52-40267, which has a main body comprising a liquid permeable inner sheet, a liquid impermeable outer sheet and an absorbent member disposed therebetween. The main body is provided with a side flap extending laterally from each side edge thereof. Each side flap is provided with an expandible member forming a gather. Each side flap is further provided with fastener means on the rear surface of its side edge in order to provide adjustability so as to improve the fit and anti-leakage properties of the diaper. Another known diaper is of the type disclosed in Japanese Patent Early Laid-open Publication No. Sho 62-250201, in which three dimensional gathers are formed on the leg portions and a flap portion around the absorbent member is provided with a water-repellent treatment in order to improve the anti-leakage characteristics.

In order to improve the fit and ease of wear, a disposable diaper of so-called briefs type has recently been proposed in Japanese Patent Early Laid-open Publication No. Sho 57-77304. In this diaper, a front area and a back area of a pair of side flaps are connected together in order to form a pair of leg

opening portions and a waist opening portion. The leg opening portions and the waist opening portion are designed to be expandible in order to facilitate an easy fit to the wearer's body. Such a briefs type disposable diaper can usually be worn by a wearer in a standing posture. Therefore, it is often conveniently used as training wear for infants who need a training to do without a diaper, or as underwear for incontinent persons or adults who find it impossible to walk.

However, since the above-mentioned briefs type disposable diaper is necessarily relatively narrow in the under-crotch portion, the expandible elastic member cannot be positioned remote from the absorbent member. As a result, the intended expansibility of the elastic member is not available due to the effect of the rigidity of the absorbent member. Furthermore, the connected portion of the front and back areas are readily wrinkled and spaced apart because of the provision of the expandible elastic member, thus providing a route for the leakage of waste materials. Furthermore, it was found not to be possible to provide a three-dimensional structure of the leg gathers, which is very effective for anti-leakage purposes, due to the narrowness of the under-crotch portion and manufacturing difficulties.

The effective technique for making the peripheral portions water-repellent in order to prevent leakage, particularly of urine, was unable to exhibit its full effect in a briefs type diaper because in practice the narrow under-crotch portion prohibited the formation of clearly separate hydrophilic and water-repellent

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portions. Moreover, the conventional method for making a briefs type diaper rendered it impossible to provide a water-repellent portion around the waist portion.

It is only in the vicinity of the urine discharge point that the conventional disposable diaper functions to absorb and return waste materials. Therefore, only the vicinity of the urine discharge point becomes soiled, and other portions, such as the side portions of the waist, do not become substantially soiled. It is, therefore, wasteful and uneconomical to dispose of the whole diaper.

It is therefore an object of the present invention to provide a disposable diaper of briefs type which is capable of reliably preventing leakage of waste materials, which has an excellent fit and which may be worn by wearers of various sizes.

Another object of the invention is to provide a disposable diaper which allows the exchange and disposal of only that portion which becomes soiled with waste materials.

According to the present invention a diaper includes an absorbent body comprising a liquid permeable inner sheet, a liquid impermeable outer sheet and an absorbent member disposed therebetween, and a water impermeable outermost layer to which the absorbent body is fastened and which, in use, holds the absorbent body against the body of the user, the outermost layer having front and rear portions whose edges are connected together so that it is in the form of a pair

of briefs with a waist opening and two leg openings, the outermost layer carrying at least one expansible elastic member around each leg opening which forms a gather around that opening, the outermost layer also carrying at least one expansible elastic member which extends across the front and rear portions at a position between the waist and leg openings and serves, in use, to tighten the outermost layer against the body of the wearer.

In the preferred embodiment the outermost layer includes a crotch portion connecting the front and rear portions and the absorbent body is elongate and overlies at least a proportion of the front, rear and crotch portions, each side edge of the absorbent body being unconnected to the outermost layer and being provided with at least one expansible member which forms a gather in the side edge, at least in that portion thereof which overlies the crotch portion.

Thus in the diaper in accordance with the present invention the absorbent body is held against the body of the user by the outermost layer or sheet and the outermost sheet is gathered around the legs of the user so as to prevent leakage of waste materials. In the preferred embodiment, the side edges of the absorbent body are free and are also gathered, at least in the crotch region, and this further contributes to the leakproof qualities of the diaper. These qualities are further enhanced by the fact that the outermost layer is water impermeable, and preferably water repellent, whilst the absorbent body is highly absorbent or hydrophilic.

The outermost layer may carry further expansible elastic members forming gathers around the waist opening.

In the preferred embodiment the absorbent body is removably fastened to the outermost layer, e.g. by a peelable adhesive connection. This permits a soiled absorbent body to be removed from the outer layer and replaced with a fresh one whereby only a portion of the diaper need be replaced, when soiled.

Further features and details of the invention will be apparent from the following description of one specific embodiment which is given by way of example with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of a disposable diaper in accordance with the present invention;

Figure 2 is a plan view, partly cut-away, of the diaper of Figure 1 in an expanded state;

Figure 3 is a sectional view of the diaper on the line III-III in Figure 1; and

Figure 4 is a sectional view of the diaper on the line IV-IV in Figure 1.

The briefs type disposable diaper shown in the drawings includes a briefs type outermost impermeable layer 2, and an elongate absorbent body 3 secured generally to the centre of the layer 2. The outermost layer 2 is of generally overall rectangular shape but has a concave portion 6 in each side edge and is thus of reduced width over its central portion and therefore comprises front and rear portions, with side flaps 8 and 9, respectively, connected by a central crotch portion. The side flaps 8,9 extend laterally beyond the width of the absorbent body 3. The concave portions 6 form leg

openings 7 when the flaps 8 and 9 are connected to form the briefs, as shown in Figure 1. As shown in Figures 2 to 4, the absorbent body 3 is of generally elongate rectangular shape smaller than the outermost layer 2 and extends over the crotch portion of the sheet 2 between points adjacent the ends of the sheet 2. Each side edge of the absorbent body 3 is provided with a first elastic member 4 extending over the length of the associated concavity 6 thereby forming a leg gather 5 on the absorbent body 3.

The absorbent body 3 is secured peelably and generally centrally in the longitudinal direction, to the inner surface of the outermost layer sheet 2 by two parallel interrupted lines of adhesive material A.

As mentioned above, the edges of the side flaps 8 are connected to those of the side flaps 9, e.g. by welding to make the diaper of briefs type. Between the ends of the absorbent body 3 and the associated ends of the outermost layer 2 there are waist flaps 10a,10b extending outwardly of the absorbent body 3, which define a waist opening 11 when the diaper is in the configuration of a pair of briefs. Extending around each of the waist flaps 10a and 10b are stretched second elastic members 12 which form a waist gather 12a around the waist opening 11. Extending along the edges of each concave portion 6, laterally outside the associated side edge of the absorbent body 3, are third elastic members 13 which form gathers 13a around each leg opening 7. The fit of the diaper to the wearer is thus improved and slipping down of the diaper is prevented when it is worn. A number of fourth elastic

members 14 extend in or on the front and back portions of the outermost layer 2 at positions between the waist opening 11 and the leg opening portions 7, so that the diaper fits the wearer better, particularly around the body.

The absorbent main body 3 is positioned such that when it is adhered to the outermost layer 2, the gather 13a around each leg opening caused by the third elastic members 13 does not overlap with the associated gather 5 in the body 3. The absorbent body 3 comprises a liquid permeable inner sheet 15 which, in use, contacts the wearer's skin, a liquid impermeable outer sheet 16 and an absorbent member 17 interposed therebetween. The absorbent body 3 is provided with main body flaps 18 extending laterally from each side edge of the absorbent member 17, and the first elastic members 4 for forming the gathers 5 are provided in the side edges of the main body flaps 18 and are stretched in the longitudinal direction of the absorbent body 3.

The absorbent main body 3 is adhered at its bottom surface, i.e. at the outer sheet 16, to the outermost layer 2 by the adhesive A which is inside the body flaps 18 so that the leg gathers 5 can be easily formed.

The inner sheet 15 is liquid permeable so as to permit waste materials to permeate therethrough into the absorbent member 17 and to have a feel approximating to that of conventional underwear. Examples of such liquid permeable sheets are woven fabrics, nonwoven fabrics, perforated films and the like. Leakage of

urine, etc. through the peripheral portion of the inner sheet 15 can be prevented by applying a water-repellent treatment to the peripheral portion thereof, e.g. by applying a hydrophobic compound such as oil solution of the silicon series, paraffin wax or the like to the peripheral portion 2 or applying a hydrophilic compound, such as an alkyl phosphate, to the entire inner sheet 15 and then cleaning the peripheral portion with warm water.

The outer sheet 16 is a liquid impermeable sheet, e.g. formed by stretching a thermoplastic resin with an added filler and having moisture permeable properties or a sheet having a feel similar to that of the wearer's underwear, such as a composite material composed of a film and a non-woven fabric or a film and a woven fabric.

The absorbent material 17 is preferably formed chiefly of an open cell pulp but also of a high molecular weight absorbent polymer. Another preferred composition of the absorbent member 17 is a mixture of a thermoplastic resin, a cellulosic fibre, and a high molecular weight water absorbent polymer subjected to heat treatment. The high molecular weight water absorbent polymer may be located in any of the upper layer, intermediate layer and lower layer of the absorbent body and it may also be mixed with a pulp. The high molecular weight water absorbent polymer is preferably in granular form and able to absorb and retain more than twenty times its own weight of liquid and able to be gelled. Examples of such high molecular weight water absorbent polymers are

starch-acrylic (salt) graft copolymer, a saponified material of starch-acrylonitrile copolymer, bridged material of sodium carboxymethylcellulose, acrylic (salt) polymer and the like. The absorbent member 17 is preferably of hourglass shape, as shown in Figure 2, but it may also be rectangular.

The outermost layer or sheet 2 is preferably a highly flexible sheet which is liquid impermeable but air permeable and which has a feel similar to that of conventional underwear. Examples of such a sheet are woven fabrics, non-woven fabrics and the like, which have been subjected to a water-repellent treatment. A highly flexible sheet, one or both surfaces of which are laminated with a non-woven fabric, is particularly preferred because it has a comfortable feel and an excellent ability to prevent oozing or leakage of urine.

The first, second, third and fourth elastic members 4, 12, 13 and 14 are connected to the absorbent body 3 and the outermost sheet 2 in generally stretched states by means known in the art, such as ultrasonic welding, heat welding, adhesive etc. Any material known in the art, such as yarn rubber, flat rubber, film type rubber or tape-like foam polyurethane can be used, and each elastic member may be unitary or multipart construction. The stress is particularly preferably 70 to 100g when they are stretched by 150%.

A known peelable adhesive material may be used as the adhesive material A, and such adhesive material A is adhered at a plurality of spots or linearly on the

inner surface of the absorbent body 3.

Operation of the diaper is as follows:

The side edges of the side flaps 8 and 9 of the outermost sheet 2, as seen in the expanded state shown in Figure 2, are connected together to form a briefs type diaper having a waist opening 11 and a pair of leg openings 7. The absorbent main body 3 is peelably adhered to the inner surface of the sheet 2.

The legs of the wearer are inserted into the waist opening 11 and the diaper is then pulled up in order to insert the legs into the leg openings 7. When being worn, gathers are formed at the waist opening 11 of the outermost sheet 2 and at the leg openings 7 in order to improve the fit and compliance to the wearer and to prevent leakage. Moreover, the fit around the body is improved by virtue of the provision of the fourth elastic members 14 around the body.

The absorbent body 3 is also provided with leg gathers 5 so that waste materials may not leak from the absorbent body 3 onto the outermost layer 2. Since there are double gathers around each leg, i.e. the gathers 5 and 7, a reliable prevention of leakage through the leg openings is ensured.

After the absorbent member 17 has been soiled, the absorbent body 3 is peeled off the outermost sheet 2 and a new absorbent body 3 is adhered in its place. Thus only the soiled absorbent body 3 need be replaced and not the entire diaper.

It will be appreciated that the present invention is not limited to the embodiment described above, but can be modified in various ways.

CLAIMS

5 1. A diaper including an absorbent body comprising a liquid permeable inner sheet, a liquid impermeable outer sheet and an absorbent member disposed therebetween, and a water impermeable outermost layer to which the absorbent body is fastened and which, in use, holds the absorbent body against the body of the user, the outermost layer having front and rear portions whose edges are connected together so that it is in the form of a pair of briefs with a waist opening and two leg openings, the outermost layer carrying at least one expansible elastic member around each leg opening which forms a gather around that opening, the outermost layer also carrying at least one expansible elastic member which extends across the front and rear portions at a position between the waist and leg openings and serves, in use, to tighten the outermost layer against the body of the wearer.

10 2. A diaper as claimed in claim 1 in which the outermost layer includes a crotch portion connecting the front and rear portions and the absorbent body is elongate and overlies at least a proportion of the front, rear and crotch portions, each side edge of the absorbent body being unconnected to the outermost layer and being provided with at least one expansible member which forms a gather in the side edge, at least in that portion thereof which overlies the crotch portion.

15 3. A diaper as claimed in claim 1 or claim 2 in which the outermost layer carries a least one expansible elastic member around the waist opening which forms a

gather around that opening.

4. A diaper as claimed in any one of the preceding claims in which the outer sheet has water-repellent properties.

5 5. A diaper as claimed in any one of the preceding claims in which the absorbent body is removably fastened to the outermost layer.

10 6. A diaper as claimed in claim 7 in which the absorbent body is fastened to the outermost layer by a peelable adhesive connection.

15 7. A diaper substantially as specifically herein described with reference to the accompanying drawings.
